How long the red flag can wave - Coal Chemical Industry Outlook 2015

In the winter of 1927, Jinggangshan, Jiangxi Province, there was a pessimistic atmosphere about the revolution; somebody questioned that how long the Red Flag can wave?

In 2014, as the rapid development of China's economic growth slowdown suddenly and switch to the "new normal." International oil prices fell sharply and coal chemical encountered a cold.

In the spring of 2015, the industry seems to be still in the winter time. How long can the coal chemical red flag wave? The issue was placed in front of decision makers and industry people.

1. The key factors of coal chemical Success in China

Around the world, the crude oil and natural gas based petrochemical is the mainstream. In addition, only South Africa and the United States were built commercial CTL (Coal to Liquids) and Coal to SNG projects respectively. Modern coal chemical industry - CTL, SNG, CTO, CTMEG has made full-scale development in China only.

During the decade of 2004-2013, the national policies constrained repeatedly the coal chemical industry, while industry developed well and achieved success. Not only the market size but also the product innovation and commercial applications, China no doubt is ahead of the world. For its success, ASIACHEM has summarized six key factors already.

1.1 Resource possession of "coal-rich, oil-lean and gas-lacking" and vast demand on energy and chemical products

Only when "coal-rich, oil-lean and gas-lacking" is simultaneously the sides of a coin, there would be both market space and driving force to develop coal-based oil/gas substitutes. The United States hold abundance of coal, oil and gas resources. However in 1970s-1980s, contradiction between economy development in North Dakota and insufficient natural gas supply, as well as huge reserve of lignite found in local area, promoted the birth of world first commercial SNG project, Grand Plain SNG plant.

Phase II development was once planned for Grand Plain SNG project, and a feasibility study was prepared. But given the shale oil/gas revolution, gas supply has been in surplus in US market and suffered from falling price, the phase II project lost the feasibility probably forever.

CTL development by SASOL, South Africa was mainly forced by the oil embargo of international society during racial segregation. To meet domestic demand on refined oil products, SASOL introduced Lurgi gasification process and, on the basis of licensed F-T process, developed its own version featuring of combined fluidized bed and slurry bed.

China domestic annual crude oil production keeps about 200 Mt for many years, while the import increases year by year. China produced 208Mt of crude oil in 2013, the year's net import was recorded 280Mt, showing a foreign dependency of 57% and more. Such gigantic crude oil import made CTL industrial demonstration a necessity, to secure oil supply to key sectors in extreme situation by CTL projects and technology reservation.

China possesses prospective coal reserve of 4Tt, with the majority in Xinjiang and Ordos Basin. Raw coal in these remote regions is not easy to enter middle and eastern China markets because

of transportation restraints, and to develop SNG and enter long distance NG pipeline become a rational option.

1.2 Government's ambition for economy development and undertaking's access to coal resource

Raw coal price was up going in the period of 2003-2012; the golden decade of Chinese coal industry though brought great profit for coal producers, also remained bitter memory for downstream users in particular power generation companies. Power companies were promptly extending their business towards the upper end and engaging in coal mine exploitation, to reduce cost and secure raw supply; on the other hand, coal producers were also striving for acquisition of new resources and expansion of capacity, to increase their superiority.

For governmental authorities of coal resource possession, in order to develop local economy, they will incline to set up prerequisite of "local conversion" for the candidates of coal resource access. Such local conversion rate is in general 50% at least and power generation shall be excluded. Thus only large size coal chemical production would be sufficient to meet the local conversion prerequisite.

1.3 Abundant capital flow brought by stimulus policy

After 2008 financial crisis, Chinese government granted a series of economy stimulus policies represented by the "Four Trillion" in 2009, bringing rash of capital for the country's infrastructure and heavy chemical construction.

Chinese commercial banks also bear the order of loan amount. Most of large coal chemical projects are invested by central government owned enterprises, with pledge of first class assets, i.e. coal mines, so as to become ideal object of bank loan issuance.

1.4 Good coal chemical profitability thanks to the high oil price

China produced coal chemicals are principally substitutes of oil and gas products, namely gasoline, diesel, olefins, ethylene glycol, methanol, ammonia etc. From 2011 up to 2014, international market crude oil price was stabilized at USD100/bbl level, providing strong back-up for Chinese modern coal chemical industry development.

As shown by ASIACHEM data model, on the basis of CNY150/t in 2014 market price of typical Xinjiang produced coal species (5000kCal bituminous), tax included complete cost of CTO product, East China delivery, is calculated only CNY6000/t, showing spacious margin under the same period PE/PP price in East China market, CNY11000/t.

1.5 Demand on clean fuel to mitigate haze climate in urban area

To treat haze problem in urban area and mitigate atmosphere pollution, demand on clean fuel, natural gas and ultralow sulfur gasoline/diesel is and will continue increasing.

NDRC "Energy Industry Enhancement of Atmosphere Pollution Prevention & Treatment Working Plan", published in Mar 2014, proposed to explore new source for clean fuel supply, fully play ultralow sulfur advantage of CTL product, and press forward CTL projects in Yulin, Shaanxi, Ordos, Inner Mongolia and Changzhi, Shanxi etc, with targeted capacities of CTL and SNG of 10Mt/a and 32bnm3/a respectively by 2017.

Under the background and with the successes of CTL/SNG demo units, Chinese policy makers are relaxing regulation on coal chemical construction, and a number of new CTL and SNG projects recently obtained preliminary approval.

1.6 Cost reduction caused by localization of equipment & technology

As a capital and technology intensive industry, single coal chemical project of economic scale calls for vast investment, resulting in higher financial and depreciation in cost structure. For a project fully or mostly relying on imported equipment and process, without the competition from local counterparts, the capital investment would become unbearable high.

A few of countries, USA, China and Germany, are the only ones worldwide having established the total industry system. Chinese government pays particular emphasis on “Introduction, Digestion & Absorption” of imported advanced technologies. Chinese equipment industry development and local developed coal chemical processes getting matured in recent years have depressed the price of import and hence reduced project investment and improved profitability.

2. The financing of coal chemical projects impacted by coal price decrease

To analyze a large and complex problem that requires the decomposition of various factors, and to study these factors respectively. This is the scientific method.

There are 6 factors for coal chemical success.

A. Resource possession of "coal-rich, oil-lean and gas-lacking" and vast demand on energy and chemical products
B. Government's ambition for economy development and undertaking's access to coal resource
C. Abundant capital flow brought by Governmental stimulus policy
D. Good coal chemical profitability thanks to the high oil price
E. Demand on clean fuel to mitigate haze climate in urban area
F. Cost reduction caused by localization of equipment & technology

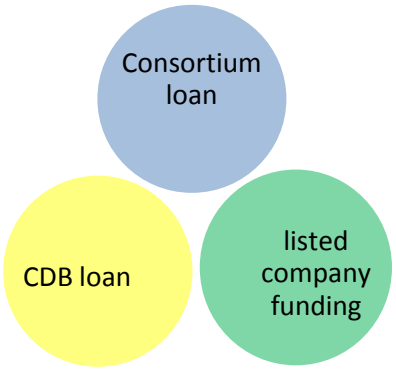
Apart from the noise of the public medias, after a sober analysis, we can find that the A, B, E, F factors did not change. The changes are only the C and D factors: the quit of Governmental stimulus policies, the falling price of coal caused the financing difficulties of coal chemical project; decrease of oil price and economics decline of coal chemical products.

ASIACHEM has studied the coal chemical financing. Modern coal chemical projects are now being developed towards the orientation of economy scale and bigger size, calling for vast investment. Taking typical processes for example, capital investment on a 1.8Mt/a methanol to 600kt/a olefin CTO project is estimated CNY22bn; capital on a 4bnNm3/a SNG project (pipeline expenses excluded) would be CNY26bn. Therefore, the owner has to raise money at different project stages to ensure smooth and expedite construction.

Company financing and project financing are two ways large size modern coal chemical development. The former requests the parent company to lay sufficient capital in a newly developed project. As such new project company lacks of business credit record, it has to rely on parent’s vouch to obtain loan, but such vouch would negatively affect on the parent’s credit for refinance. Project financing refers to financing directly in name of the construction project and guarantee the repayment obligations exclusively by the project’s own predicted revenue and assets. For a bank or other financial agent, project financing means higher risk so that the project company needs to pay higher financial cost.

Financial cost has significant effect on project economy. As shown by ASIACHEM’s calculation, financial expense and depreciation often account for high up to 20%~40% of the coal chemical

production cost. Low cost financing is therefore an effective mean to control capital investment and hence to reduce production cost, of an importance never less than that of technology selection and engineering construction etc.



Both company financing and project financing are widely applied in Chinese coal chemical industry practice rightly because of their own advantages and disadvantages. For the monetary resources, with the exception of China Development Bank (CDB), most other commercial banks prefer the arrangement of consortium loan to share the risk. Listed company to raise fund is another important source of capital for Chinese coal chemical projects. Following are several cases present to introduce typical financing arrangement of coal chemical projects.

Consortium loan pattern is the way to obtain support from several banks to diversify risk, shorten the time of financing, and to secure adequate funds in all the project construction stages. CDB is of capital abundance and mid-/long term financing advantages best fit to large size coal chemical project construction. Listed company is permitted to raise fund from security exchange market, to help fast development and expansion of the company's business. But no matter what kind of financing is employed, the assets valuation of coal chemical project owners is very significant.

When the coal price is low, the coal business will have only meager profit or even losses, and higher corporate debt ratio, which will increase the difficulty of financing and the costs will rise accordingly. This is actually the difficulties of the current coal chemical project financing.

3. The low oil impacts on coal chemicals are over estimated

Modern coal chemical industry has formed a certain scale of investment, there are four main directions: CTL, CTL, Coal to SNG and CTMEG. Since mid-2014, the international crude oil price had fallen, causing panics in the industry. Many people considered there is no more competitiveness of coal chemical industry. But the reality is that the economic benefits for the coal chemical industry are various because of the different products.

3.1 CTO

In March 20, 2015, China Shenhua released 2014 annual report, in which the actual impact of oil price decrease on CTO can be figured out.

In 2014, Shenhua Baotou Coal Chemical Company produced PE/PP 525,000 tons in total, and sell PE 265,500 tons with the average price of 8871.8 RMB/ton; sell PP 268,100 tons, the price of 8628.9 RMB/ton. China Shenhua's coal chemical business revenue is 5.88 billion RMB; cost is 3.82

billion RMB (depreciation included); the profit is 1.408 billion RMB. Coal chemical business operating costs fell 1.2%, and profit decreased by only 1.8%, which are far less than the decline of the coal and power generation business, reflecting the good economy.

Shenhua Baotou Coal based polyolefin cost and profit (RMB / ton) 2014

亚化咨询 ASIACHEM	Cost	Price	Profit
PE	5,405.4	8,871.8	3,466.4
PP	5,212.4	8,628.9	3,416.5

It should be noticed that in 2014 China Shenhua Coal Chemical Division has purchased coal from its parent company – Shenhua Group with the internal price of 296.5 RMB/t, a 11.7% up compared with 2013; at the same time, total sales of polyolefins (PE and PP) increased 0.15% year on year, indicating that the economics of coal of polyolefins in 2014 has not been significantly impacted by international oil prices.

ASIACHEM believes that the cost, supply and demand are important factors that affect the price of polyolefins, and due to the trend of olefin feedstock diversification, the impact of oil prices on the olefin is weakening. For example, in Q1 2015, the international oil price has dropped 50% comparing Q1 2014, while the polyolefins prices in East China market fell only about 10%.

2) CTMEG

The case of CTMEG is similar to the CTO. According to Danhua Technology (the parent company of Tongliao GEM) released 2014 annual report, in 2014 the company achieved operating revenue of 1.027 billion RMB, an increase of 38%, and net profit of 17.43 million RMB.

Annual data show that in 2014 Tongliao GEM produced a total of 126,600 tons of MEG, the total cost was 537 million RMB, accordingly ASIACHEM calculated Tongliao GEM's MEG production cost in 2014 is 4242 RMB/t (including raw materials, labor wages, energy, depreciation, Danhua Announced the average cost is 4,270 RMB/t), about 1800 RMB/t drop compared to 2013. ASIACHEM study suggests that reducing of cost is owing to the upgrading the operation rate, and the decrease of depreciation, reducing labor and raw material consumption.

Annual report disclosed in first half of 2014, Tongliao GEM production was still not stable, the average production load was about 64%. After shut down for maintenance in June, production load and product quality has improved significantly, the annual total production was 126,600 tons of MEG, 52,200 tons of oxalics, the annual average load was about 76%, of which the second half of the average load was about 89%. If the production load achieved the design value, the profitability will be further enhanced.

3) CTL

CTL products pricing are regulated by the NDRC, the product distribution channels is also restricted. In the context of international oil decrease, three consecutive increase of domestic fuel consumption taxes, compared with the same period in 2013, the increase rate has been as high as 50%.

The increase of fuel consumption tax caused the substantial increase in tax costs of CTL. ASIACHEM's data show that, compared with the same period in 2013, the current CTL companies to bear the cost of the consumption tax rise as high as 50%.

亚化咨询 ASIACHEM	2013	Q1 2015	Increase Rate	Consumption tax

93# Gasoline	1.0 RMB/L	1.52 RMB/L	52%	2098 RMB/t
0# Diesel	0.8 RMB/L	1.2 RMB/L	50%	1425 RMB/t

ASIACHEM estimates, for a large scale CTL project, the designed capacity is 1 Mt/a, if operating at full capacity, if the target product is diesel, the tax cost more than 1.4 billion RMB/a. If the target product is gasoline, the consumption tax is 2.1 billion RMB. It is a significant burden for the CTL firms.

Nevertheless, in 2014, CTL demonstration projects still achieved good results. Yitai Ordos 160,000 t/a CTL unit achieved a safe and stable operation of 330.3 days, the cumulative production of various types of oil 178,000 tons, the annual sales income of 1.14 billion RMB, net profit of 174 million RMB.

4) SNG

SNG is not high value-added coal chemical project. Although it is competitive comparing with domestic shale gas and imported natural gas, SNG is more expensive than the domestic produced conventional natural gas.

More important, SNG has the issue of wastewater treatment. The demonstration project has been put into operation, Datang Keqi and Xinjiang Qinghua used the Sedin fixed bed gasification technology, which has the advantage of the higher methane content in syngas, and higher efficiency; but the drawback is wastewater treatment has more difficulties. In the beginning of the design for the gasification, the difficulty of wastewater treatment has not been adequately estimated, caused the troubles after project commissioned. Also, the environmental protection authority keep stricter attitude on the following EIA approval of SNG projects.

For example, the Suxin Hefeng energy's coal to SNG project is a cooperation project between Jiangsu and Xinjiang local Governments - "On deepening the clean energy strategic cooperation agreement of two provinces" the first phase of 4 billion Nm3/a of SNG and 26 million t/a coal projects were planned to be put into operation in 2017. The EIA report of the project application was rejected, and this case shocked the industry.

4. Outlook and conclusions

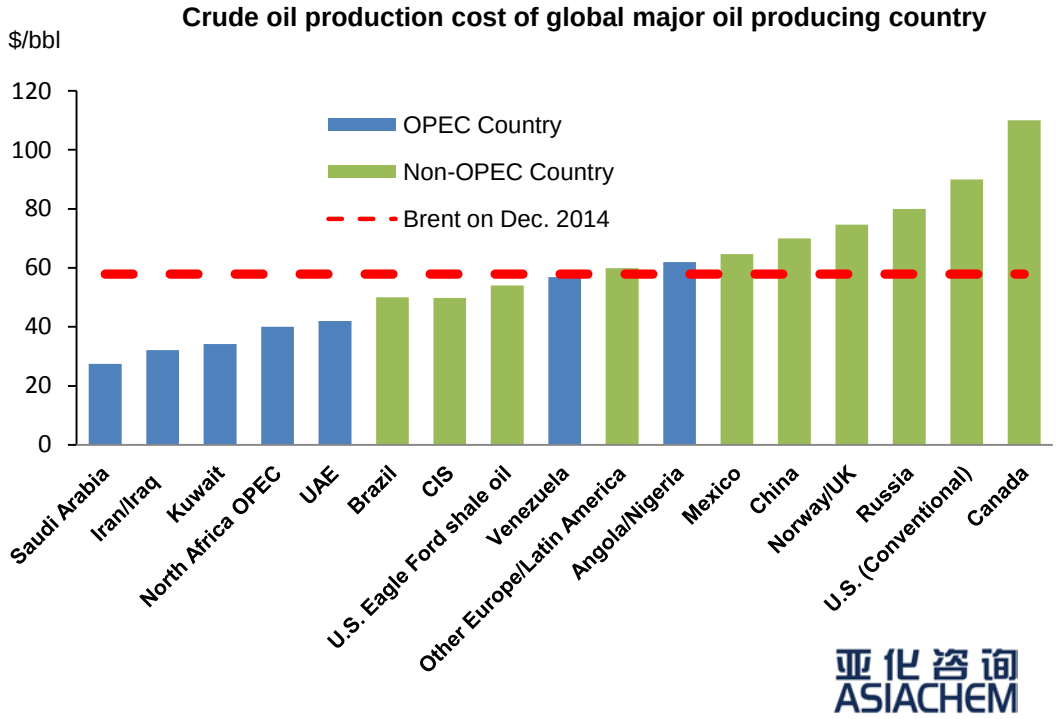
1) International oil price

ASIACHEM believe that the international oil prices since June 2014 began to fall, is caused by both supply and demand. For demand, slowing economic growth in emerging economies led to lower oil demand growth; at the same time, the North American shale gas production has continued to increase. Crude oil supply growth exceeds demand growth.

With the development of mature horizontal drilling and hydraulic fracturing in shale gas technology has been successfully used in shale oil, starting in 2011, the US's crude oil production increased gradually, production has been increased 930 million barrels per day by the end of 2014 from 5.5 million barrels per day, close to 960 million barrels per day of Saudi Arabia, accounting for about 10 percent of global crude oil production. Moreover, in the era of high oil prices, for the simultaneous production of shale oil and gas wells, shale oil income is sufficient to cover the cost of mining, byproduct of shale gas near zero cost, which is the reason for a long period of US natural gas incredibly cheap.

How current low oil prices impacts on the US shale oil and gas production? Undoubtedly, the US

shale oil and gas producers will cut spending. In the 4th quarter of 2014, the major US shale oil producer Continental Resources announced to reduce spending on oil and other aspects to $ 2.7 billion in 2015, compared with the initial planned expenditure reduction of about 48%. BHP Billiton announced that US shale gas projects spending cuts by 20 billion dollars. ConocoPhillips announced capital spending will be reduced by 20% in 2015 in response to the growing decline in oil prices. In fact, most of the energy companies have cut spending plans in 2015. From the second half of 2015, it is expected that the reduction effect of US shale oil investment will gradually be reflected; in 2016, the crude oil supply may decline, while oil prices will rise.

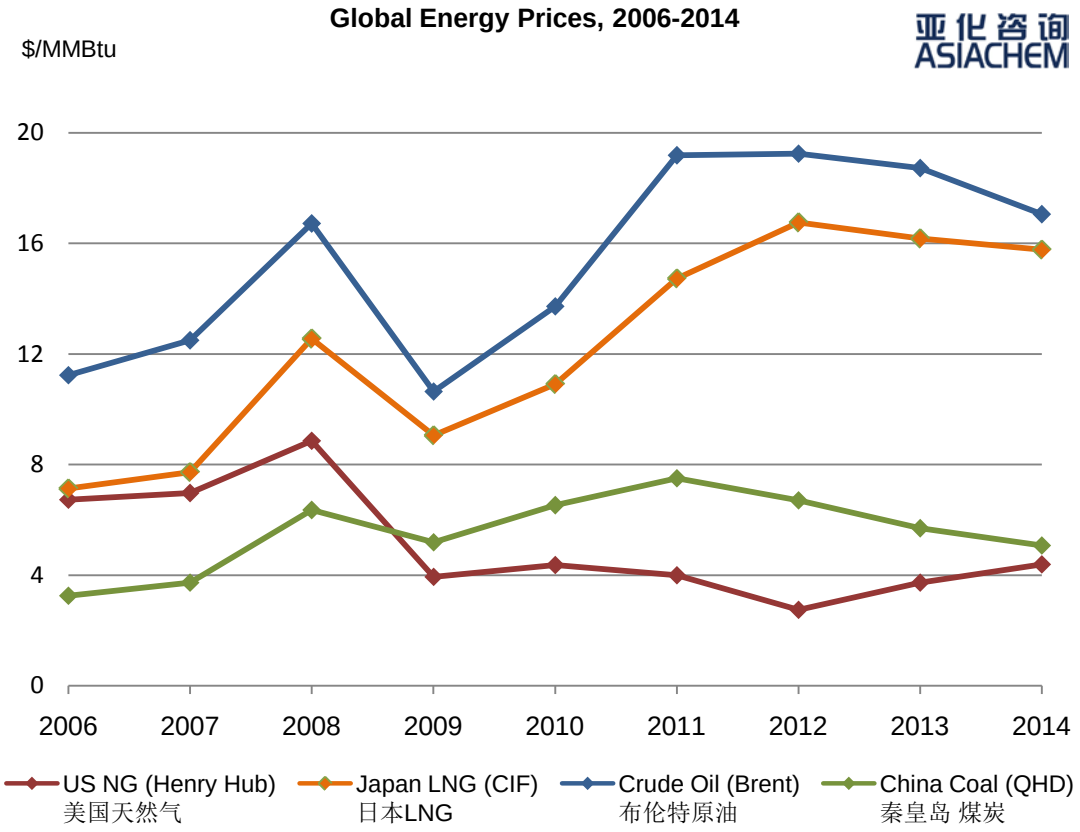


ASIACHEM considers that from the point of view on cost of world major oil producers, the international oil price less than 60 $/barrel is unsustainable in long-term. In this price only about 10 oil-producing countries such as Saudi Arabia can be profitable and low oil prices will greatly hurt the enthusiasm of deepwater exploration and development of other difficult oil and gas resources in the international oil companies, and to limit the growth of economically recoverable crude oil reserves.

In addition, international oil price is extremely sensitive on geopolitical reaction. Middle East situation is not stable, the next two years, it is possible of some events triggered panic in oil prices. Even without considering the accident, from the long-term costs and a reasonable profit perspective, the international oil price will rise to 80 $/barrel range is an inevitable trend.

2) Outlook and advices on next stage development

In terms of coal chemical industry, compared with the petrochemical, the core competitiveness is the cost. In the same calorific value basis, crude oil prices generally 3.5-4 times to price of coal. At present, even if international oil prices fell by about 50%, based on the equivalent calorific value, coal prices are still more than 2 times. Coal chemical feedstock cost advantage has not been shaken fundamentally.



Meanwhile, resource possession of "coal-rich, oil-lean and gas-lacking" and vast demand on energy and chemical products; government's ambition for economy development and undertaking's access to coal resource; demand on clean fuel to mitigate haze climate in urban area; cost reduction caused by localization of equipment & technology; these fundamentals have not changed. Therefore, it can be expected that in the medium and long term, the prospects for the development of coal chemical industry is still bright.

Since the year of 2014, China's economic slowdown, reducing demand for coal, coal companies has operation difficulties and the challenges of transition. At the same time, to develop modern coal chemical industry is great strategic significance to promote regional economic development and help the coal enterprises to upgrade and enhance the level of clean coal conversion, to protect the national energy security.

For CTL, ASIACHEM suggested that currently Chinese economy has entered a "new normal" and the international oil prices moving lower channel, in 2015, the authorities should consider the special nature of CTL industry, and to implement the differentiated fuel tax policy. This will not only help the coal business transformation, realize efficient and clean use of coal, but also conducive the country's energy security strategy. Meanwhile, for the successfully demonstrated CTL projects, it should be release the regulation on projects approval, according to the State Council’s requirement of simplifying project approval process.

For coal to SNG projects, the environmental standards should be stricter, especially the water treatment requirements. To study the experiences of successful and failed projects, and analysis of the real reasons for the success or failure, and keep more communication with the public medias, to enhance the transparency of the operation of the project, and then reduce misunderstanding outside. To create truly clean and efficient coal conversion model projects.

CTO and CTMEG are proven both in technology and economics, but not every demonstration projects are successful. Take a Coal to propylene project for example, according to the annual report in 2014 of Datang Power, the annual production of polypropylene only 92,100 tons, and methanol 387,100 tons, as well as 99,100 tons of propylene, with heavy losses. In contrast, Shenhua Ningxia Coal's project almost completely similar with Datang Duolun, in the same period, it creates nearly 1 billion RMB profit. Therefore, it should be an objective analysis that it is the problem of decision-making, technology selection, project management and implementation? These conclusions will be very valuable for the next phase of the project development.

In 2014, China produced 210 Mt of crude oil, and imported 308 Mt, showing a foreign dependency of 59.5% ASIACHEM summarized that continuing development of Chinese macro economy and tremendous demand on energy and chemical products are providing and will keep spacious market for coal conversion. Liquid fuel, natural gas, olefins, ethylene glycol, aromatics and other insufficiently supplied products in China, will for sure still be the major developing fields in modern coal chemical industry.

In the winter of 1927, Jinggangshan, Jiangxi Province, there was a pessimistic atmosphere about the revolution; somebody questioned that how long the Red Flag can wave? Chairman Mao had answered the question in theory, and which also was proven by history.

Today, under the low oil price and industry winter in 2015, after the objective analysis, we can trust that the coal chemical will develop well and becomes a significant direction in the future.

(Author: Lei XIA, Managing Director, Chief Strategic Analyst, ASIACHEM, Apr. 8, 2015)